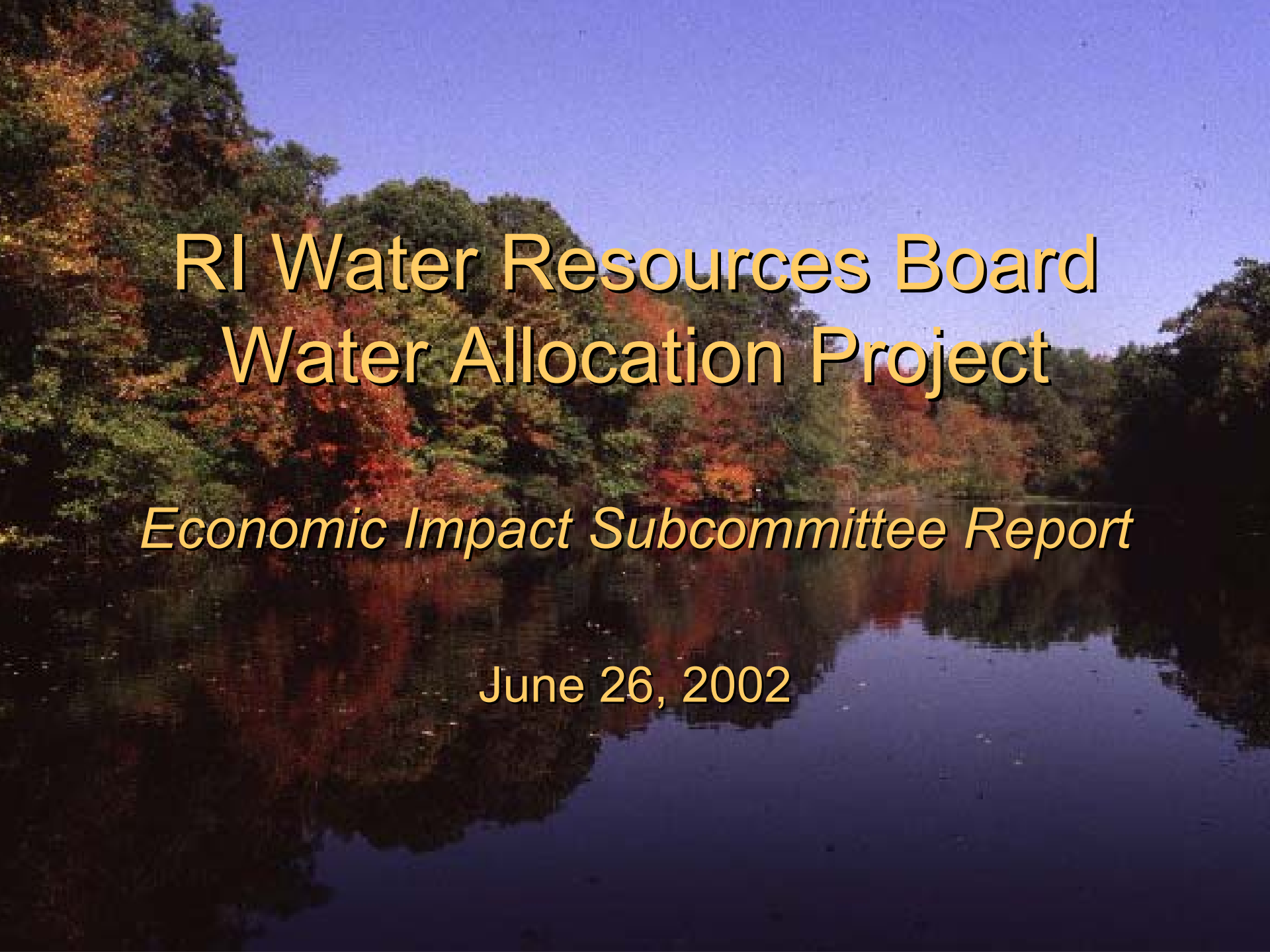


RI Water Resources Board Water Allocation Project

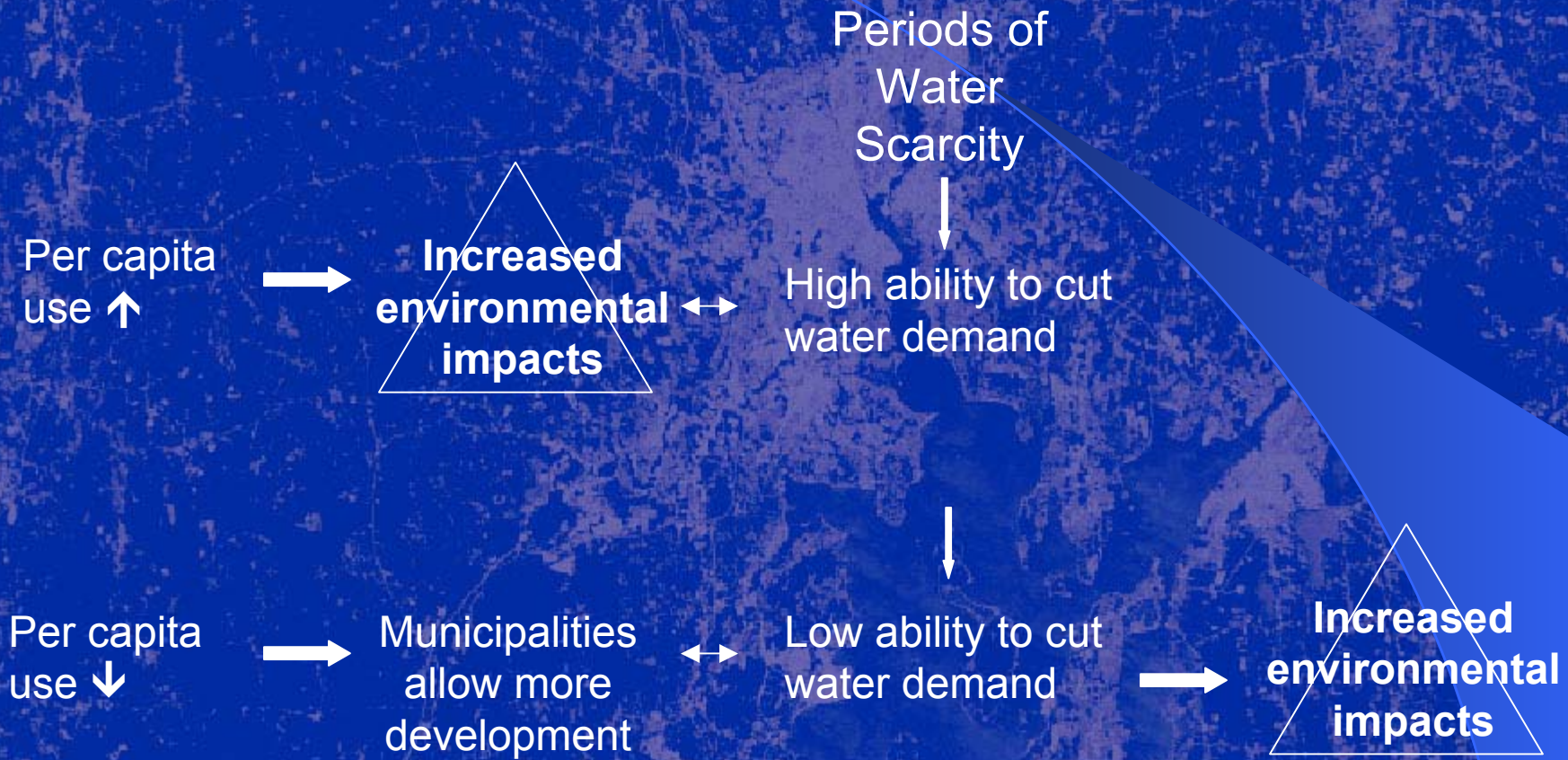
Economic Impact Subcommittee Report

June 26, 2002

Subcommittee Mission

- Evaluate the social, economic and environmental impacts of water supply and use issues
- Understand the system of interactions between water supply, land development, the environment, and the well-being of Rhode Islanders
- How can the system be managed to maximize positive economic, social, and environmental impacts?

The Conundrum



Why Conserve?

- Increase individual & community well-being
- Reduce frequency & severity of drought
- More water for ecosystems (habitat)
- Preserve economic diversity

Drawing the Line on Environmental Impacts

- Minimum stream flow standard
- Minimum wetland regulation
- Designation of priority habitats for conservation
- Some standards may be designed for economic & environmental objectives: stream flow for canoeing

Land Use Planning is Key

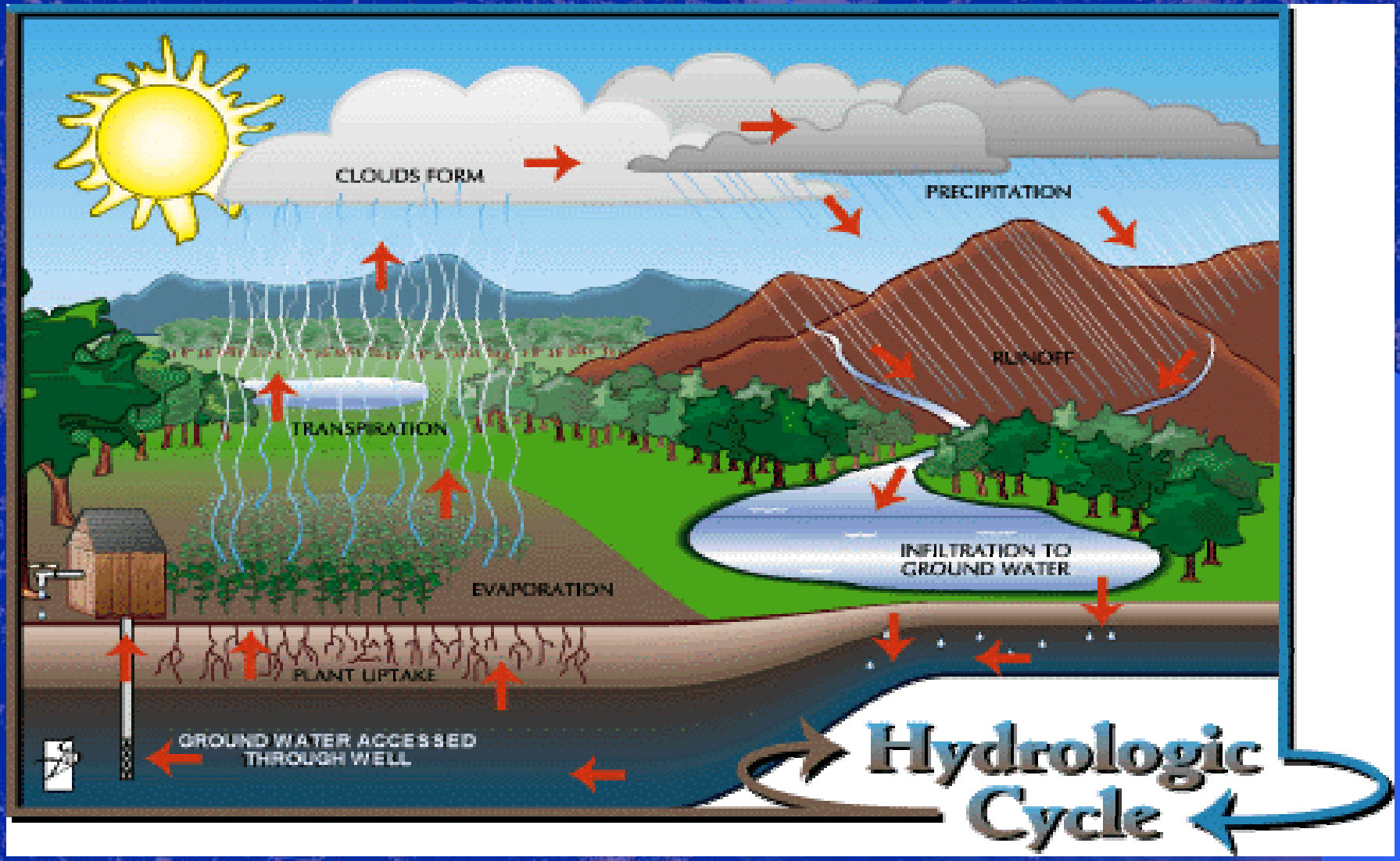
- What needs to be done?
- Where will the resources (money, technical expertise) come from?
- What is the mechanism that is going to bring communities together to plan?

Ability to Cut Demand during Drough
to offset environ., econ., & social impac

- Price elasticity
- Interruption contracts
- Conservation contracts (mitigation)
- Regulation


Water & Environmental
Impacts

The Hydrologic Cycle



Human Interruption of the Hydrologic Cycle: *Water Withdrawal*

- Precipitation captured & stored in reservoirs
  - Scituate Reservoir
- Direct pumping from rivers & streams
  - Ocean State Power
- Groundwater pumping
  - South County

Human Interruption of Hydrologic Cycle: *Water Return*

- Evapotranspiration (i.e. irrigation, cooling)
- Sewers – usually discharged out-of-basin
- Septic systems – returned to groundwater

Ecosystem Services

- Water supply & regulation
- Erosion control & sediment retention
- Waste Treatment
- Disturbance regulation
- Refugia
- Recreational opportunities
- Cultural value

Why value ecological resources?

- Show policy makers the real trade-offs for modifying ecological resources
- Because they are more difficult to value, they are often left out of the decision-making process
- The cost of economic studies is only justified to answer specific questions

Table 2. Estimates of Narragansett Bay Ecosystem Values[1]

Ecosystem Service	Global values by ecosystem service ($/acre)[2]							
	Estuaries	Shelf	Forest	Grass/Range	Wetlands	Lakes/Rivers	Cropland	Urban
Gas Regulation				2.8	53.8			
Climate Regulation			57.1	0.0				
Disturbance Regulation	229.5		0.8		1836.9			
Water Regulation			0.8	1.2	6.1	2203.6		
Water Supply			1.2		1537.8	856.7		
Erosion Control			38.9	11.7				
Soil Formation			4.0	0.4				
Nutrient Cycling	8539.1	579.1	146.1					
Waste Treatment			35.2	35.2	1690.4	269.1		
Pollination				10.1			5.7	
Biological Control	31.6	15.8	0.8	9.3			9.7	
Habitat/Refugia	56.9				123.0			
Food Production	210.8	27.5	17.4	27.1	103.6	16.6	21.9	
Raw Materials	10.1	0.8	55.8		42.9			
Genetic Resources			6.5	0.0				
Recreation	154.2		26.7	0.8	232.3	93.1		
Cultural	11.7	28.3	0.8		356.5			
Area (acres)[3]	100,208	500,000	318,995	5,636	102,249	18,756	50,112	191,572
Total Value ($/year x 1000)	**926,312.7**	**325,750.0**	**125,077.9**	**555.7**	**611,786.4**	**64,503.8**	**1,869.2**	**0.0**

Note: Blank cells = not available; Shaded cells = service does not occur or is negligible

[1] Estimates refer only to the Rhode Island portion of Narragansett Bay, not the entire watershed

[2] Calculated from the $/hectare estimates of Constanza et al. (1997) based on conversion factor of 2.471 acres/hectare. All values are in 1994 U.S. dollars.

[3] Source: Tyrrell and Harrison (2000)

Economic Value of Narragansett Bay (RI)

- **Rough Ecosystem Services (Mixed Concepts):**
  $2.1 billion/ Year

- **Value Added Concept**
  $2.3 billion/Year

- **Consumer Surplus Concept (Recreation Only)**
  $6.7 Billion/ Year

Compared to 36 Billion Gross State Product

Ecosystem Services:
The Catskill/Delaware Watershed

- Provides NYC with 1.4 billion gallons of unfiltered water a day.
- Poor land use practices degraded water quality to unsafe levels.
- Two alternatives:
  - Filtration plant
    $6-8 B in construction costs + $300 M annual operating costs
  - Watershed rehabilitation
    $1-1.5 B for land acquisition, conservation easements, and BMP promotion

Environmental Impacts
Impaired watershed ecosystem

- Decreased wetland area
- Decline in flood control
- Decline in erosion control
- Loss of ecosystem equilibrium
- Loss of pollution control & water purification ability

Environmental Impacts
Aquatic habitat loss

- Altered riffle/rapid flow sections
- Limited channel margins
- Increased temperature & light transmission
- Segmentation of river
- Sedimentation change
- Encroachment of invasive species through dry stream bed
- Wintertime freezing of stream bed bottom

Environmental Impacts
Stream flow loss

- Habitat destruction
- Decreased water quality
- Limits recreational opportunities
- Diminishes aesthetic and scenic values
- Reduces property values

Water-related Impacts of Development

- Increased demand
  - Pressure on ground and surface water resources
  - Pressure on reservoir storage capacity
  - More out-of-basin transfers
  - Greater threat of saltwater intrusion in coastal wetlands & groundwater aquifers
- Increased impervious surface
  - Decreased groundwater recharge
  - Reduced water quality

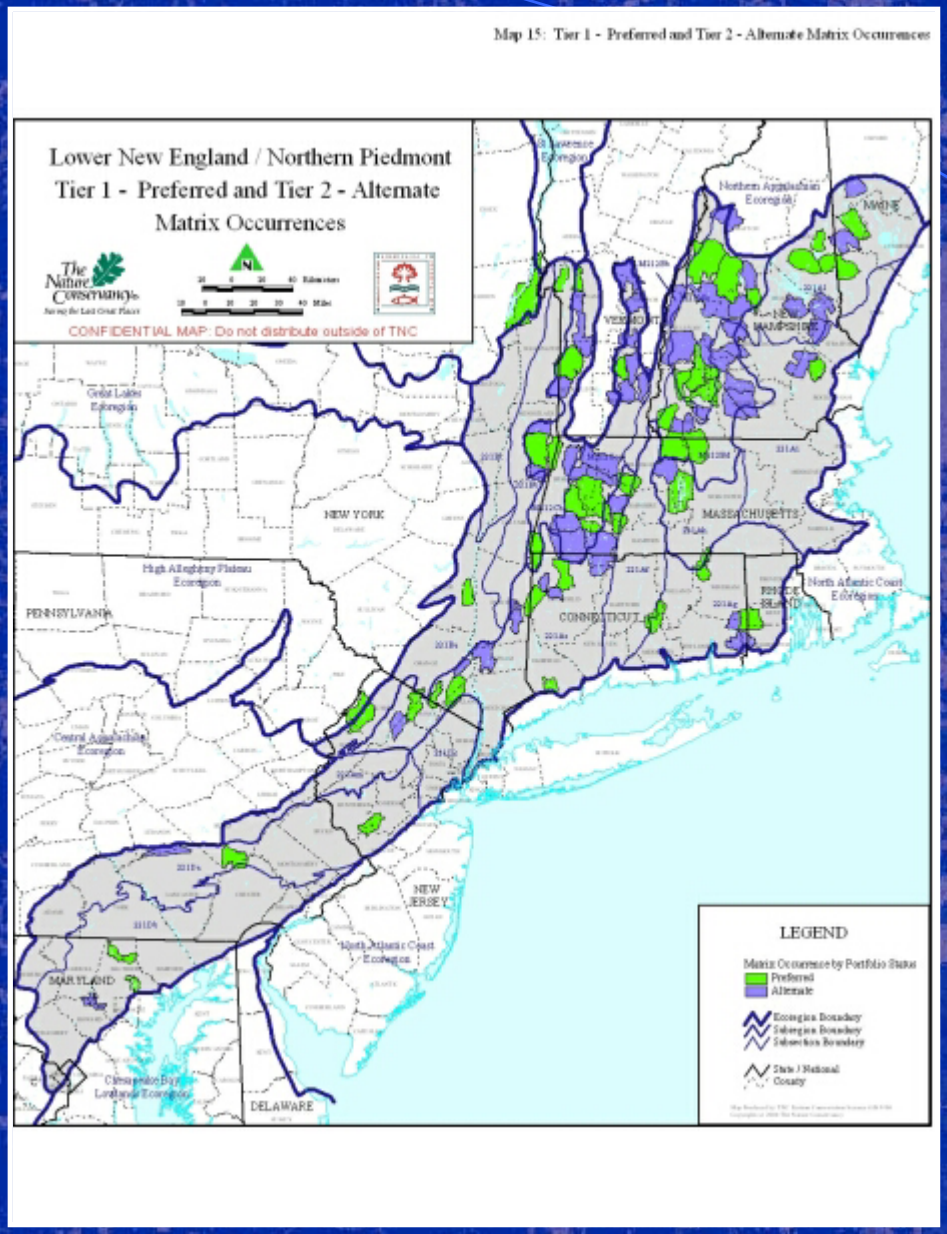
Development Practices

- Lawn and landscaping choices
- Stormwater management
- Water reuse / recycling
- Conservation and other alternatives to consumptive uses
- Case study: Amgen

Environmental Impacts:
The Ipswich River Watershed

- Heavy groundwater pumping for residential use (upper river pumped dry 4 of last 8 years).
- Sewer system diverts 80% of withdrawn water out of watershed.
- Extensive impervious surface further reduces groundwater recharge.

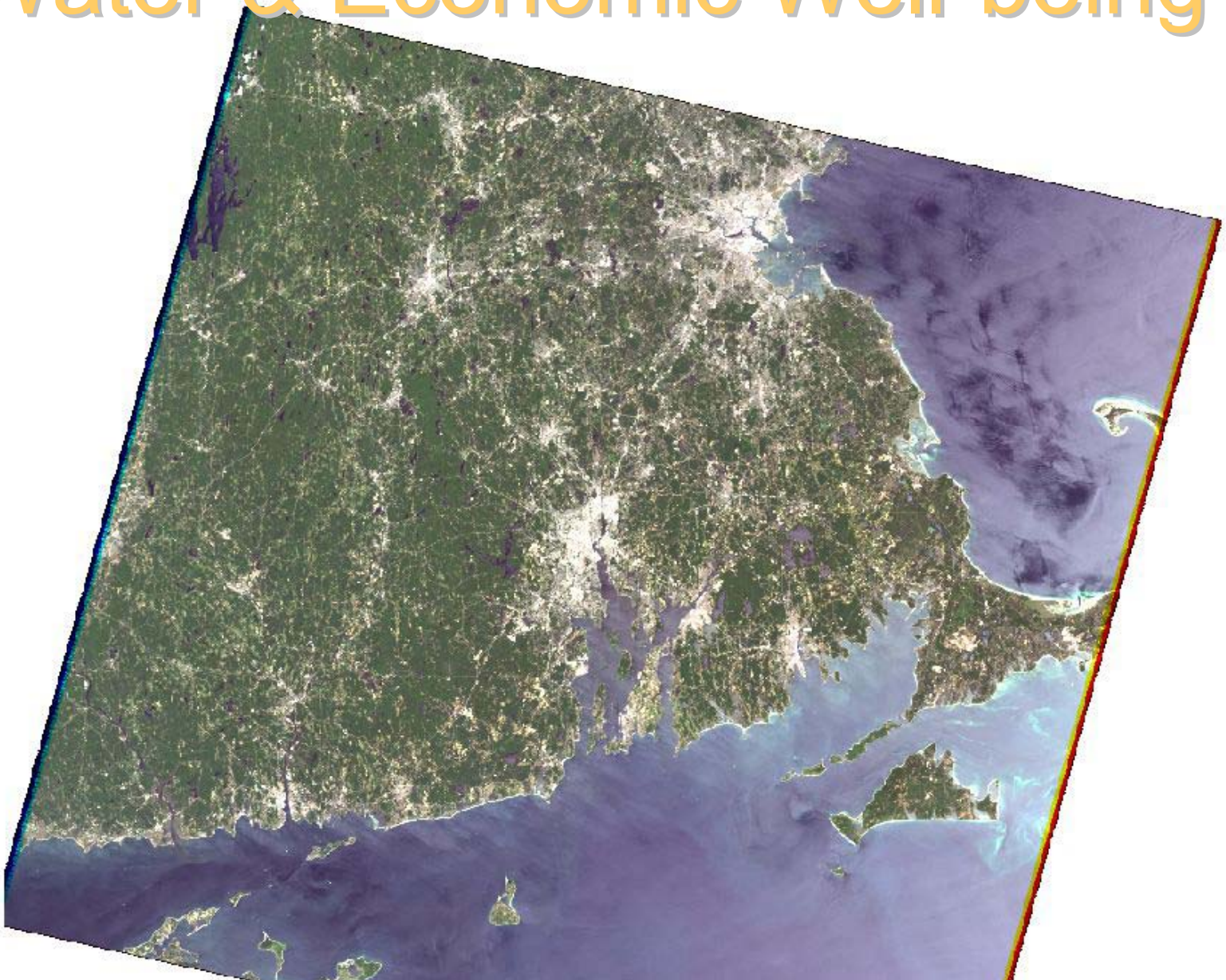
Ipswich River
Ipswich River Watershed Association



The Pawcatuck Borderlands was identified as a priority area for conservation based on the Conservancy's ten-state study of the best remaining natural systems of Lower New England.

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Water & Economic Well-being



Economic Priorities

- Increasing prosperity, not population
- Increase jobs and commercial tax base in cities. Build on Providence's assets as a hub of creativity.
- Grow high & middle wage jobs.
- Invest in the research infrastructure at URI
- Enhance quality of place, build on community character: urban, town, and village centers; rural landscapes
- Promote sustainable use of Narragansett Bay
- Preserve the Borderlands as an unfragmented forest system in perpetuity.

Pricing

- Long-term water use demand
- Short-term water demand during droughts
- Development practices

Pricing works best when consumers have:

- good information
- alternatives

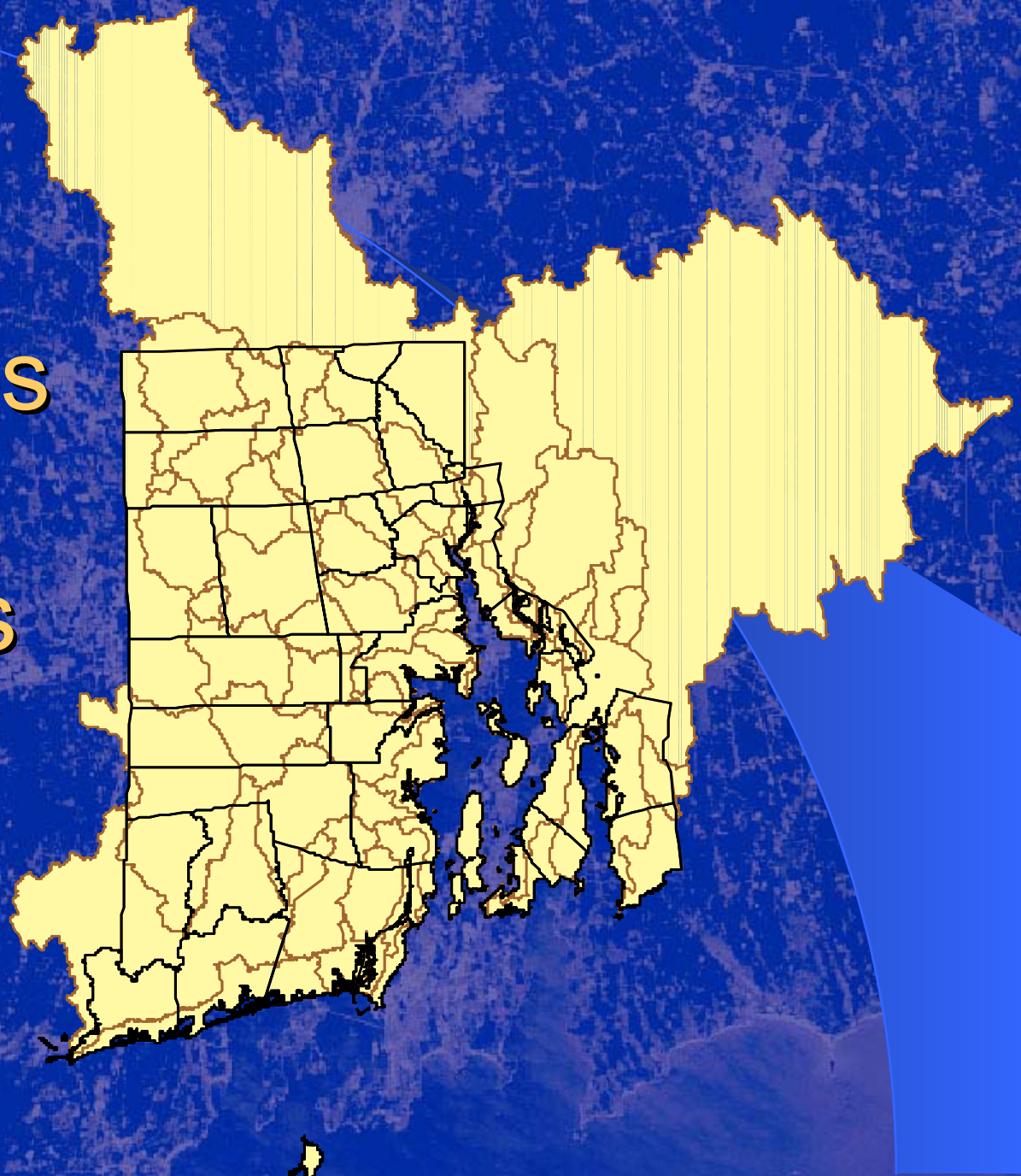
Under-Pricing of Water

- decisions do not maximize welfare
- over use of resource
- increased uncertainty
- inefficient environmental and quality of life impacts
- non-market conservation measures reduce choices
- insufficient revenues for optimum level of planning, capacity expansion, and mitigation

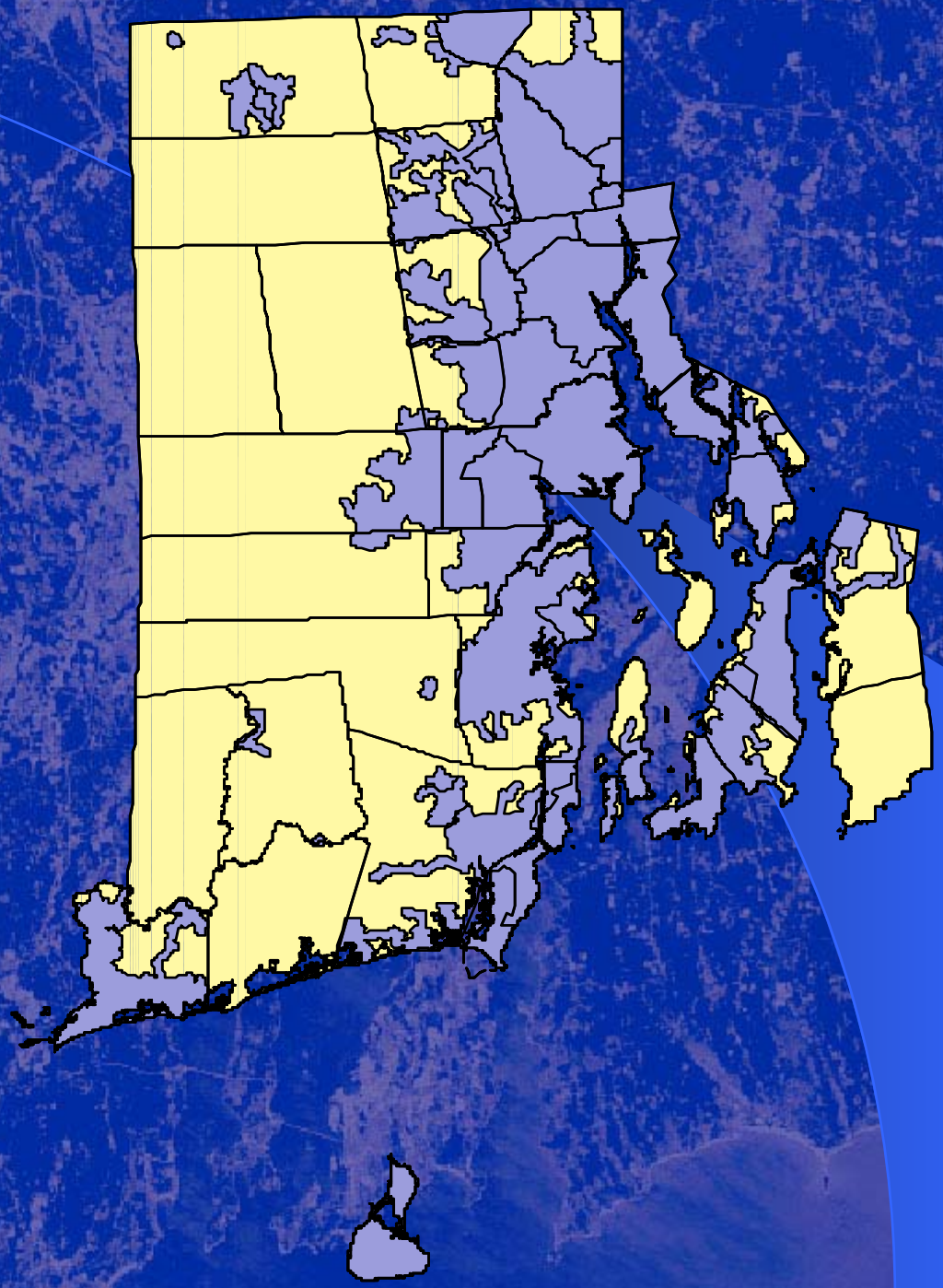
Policy Framework

- Authority
- Information
- Resources

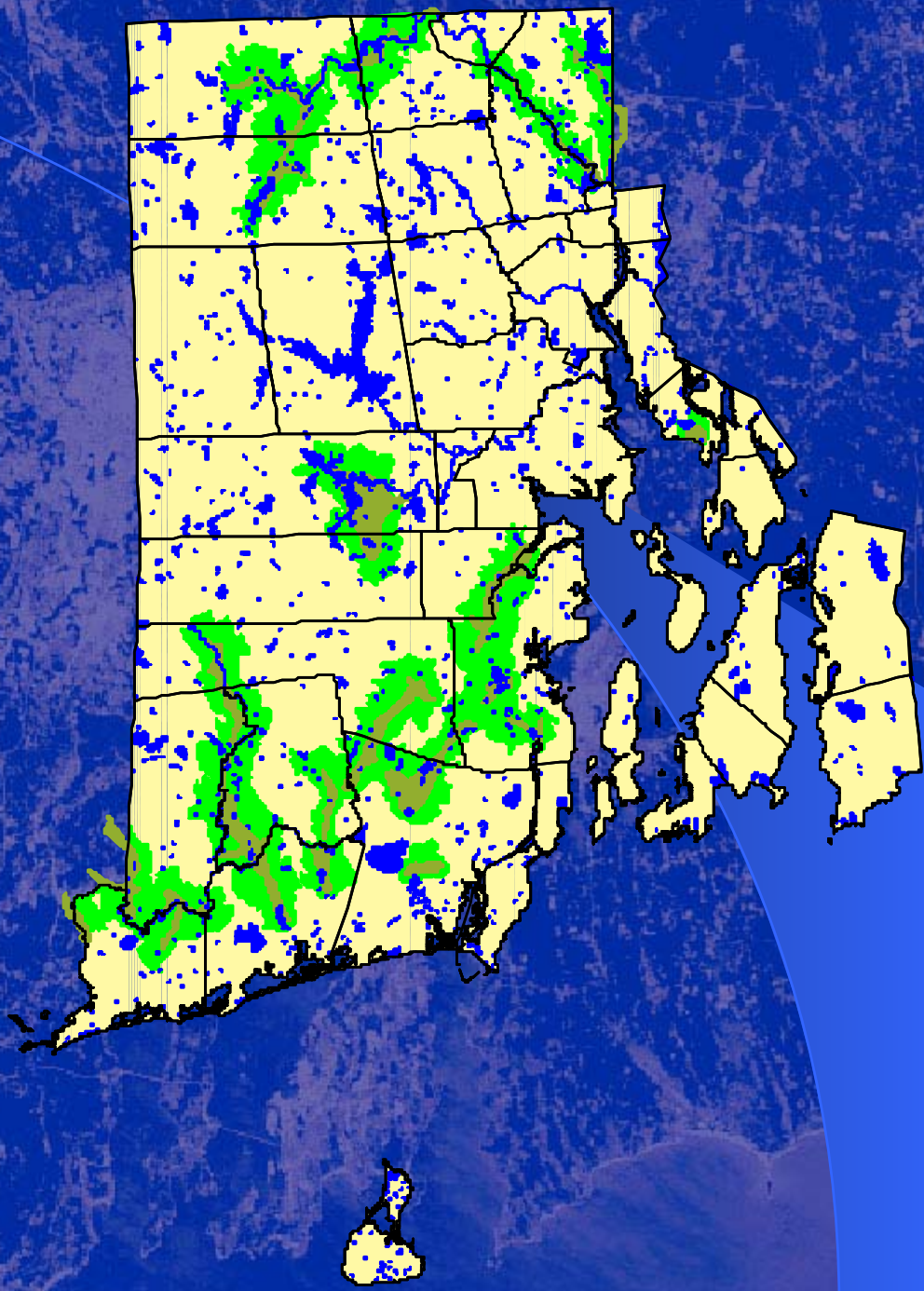
Municipalities & Watersheds



Municipalities & Water Districts



Municipalities & Ground/ Surface Water



What we need to know

- How much water is there?
  - Basin studies (WRB with USGS)
  - Ongoing monitoring of water levels: stream flow and wetlands (funding uncertain)
- What water demand and watershed impacts will regulations create?
  - Build out analysis
  - Impact modeling

What do we need to do?

- Move away from “prove it” method
- Have a state priority process for natural resources including habitats, wetlands, and waterways
- Stream flow standards for all streams, but a higher standard for priority areas
- Specific triggers for action
- Designation of authority that extends to all users including self-supply

What will it take?

- State level leadership
  - uniform build-out analysis with municipalities as partners
  - extensive technical assistance to communities to understand implications of basin studies and build-out (including evaluation of alternative zoning and regulatory scenarios)
  - authority and process to establish standards, priorities, triggers and responses
  - Demand-side technical assistance (like electric)

New resources

- It is best to support water management programs through user fees
  - Water pricing (all costs are per unit consumed)
  - Development impact fees (let the meter measure impact on demand)
  - Consider charging management fees to all sewered customers